

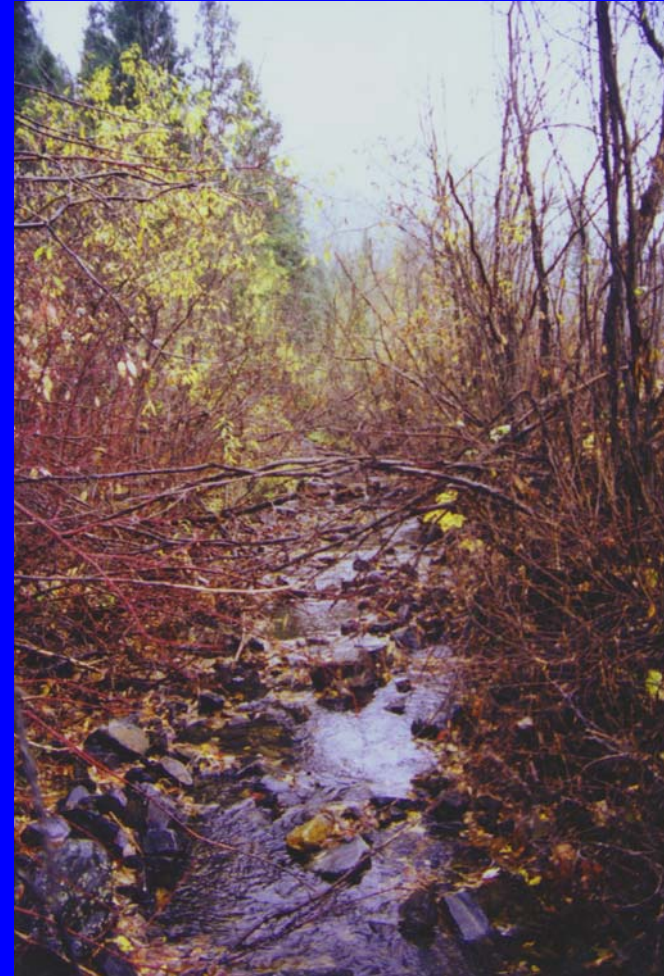
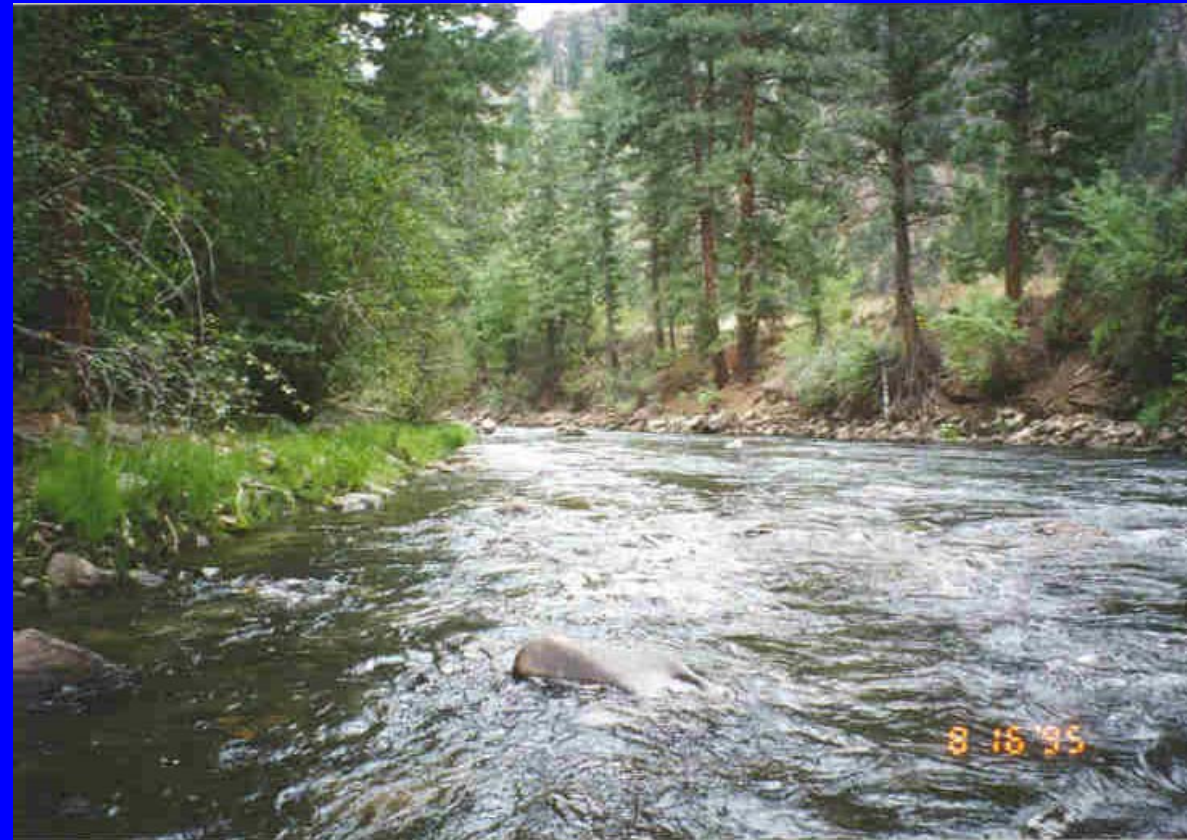
# FISH ASSEMBLAGE INDICATORS OF BIOLOGICAL INTEGRITY IN NORTHWESTERN RIVERS, MOUNTAIN STREAMS, AND DESERT STREAMS

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Quality

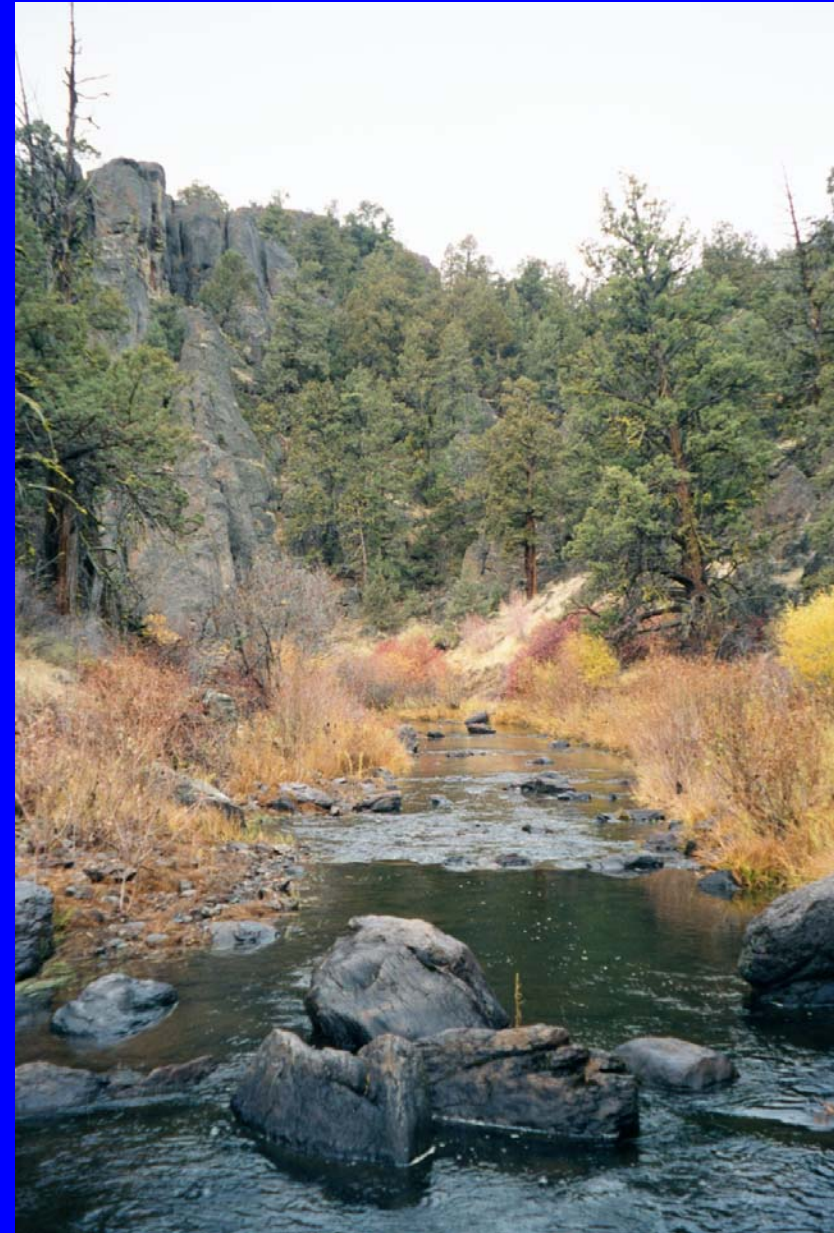
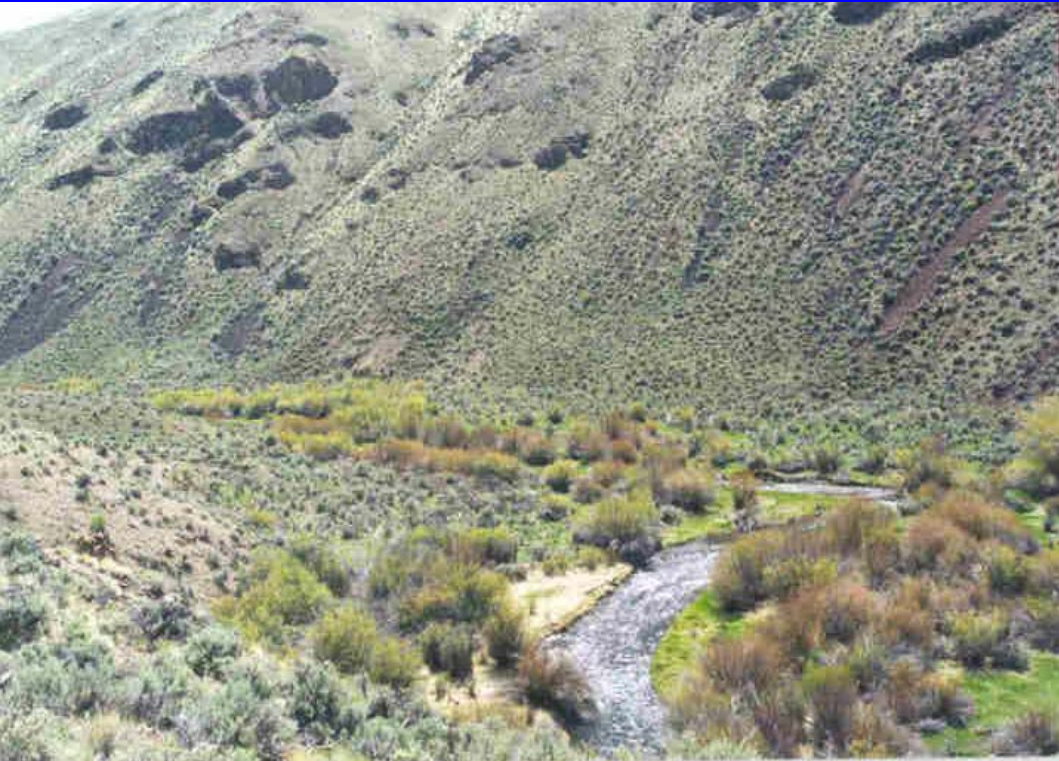
- Fish assemblages probably less used in bioassessment in western U.S. than Midwest or East
- Issues using fish assemblages as ecological indicators in the western U.S. include:
  - Naturally low species richness
  - Species richness may increase in response to disturbance
  - Extensive stocking of salmonids blurs assemblages
  - Human disturbance patterns overlay natural longitudinal river continuum patterns

- ***Mountain streams***





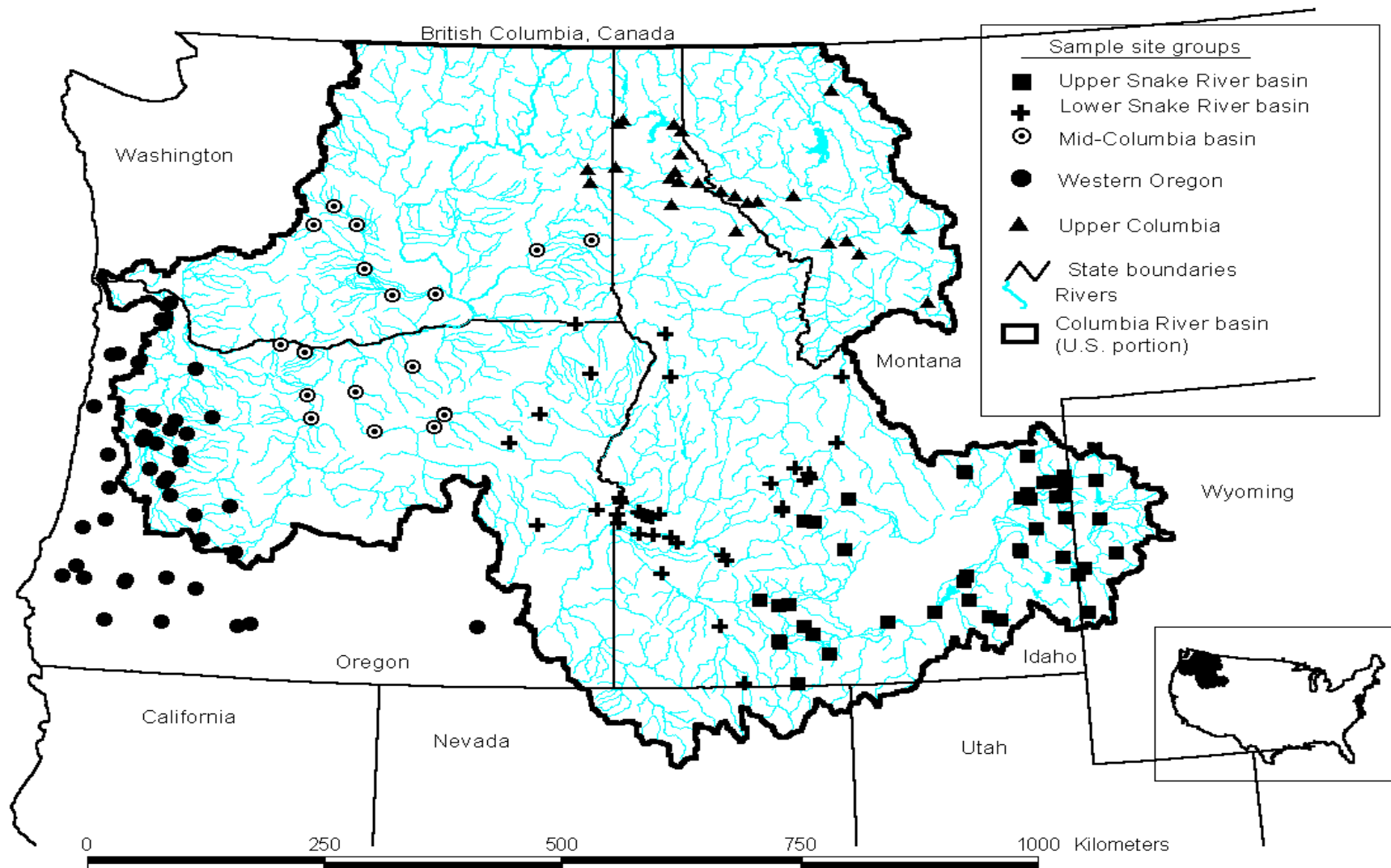
- ***Desert streams***



- *Rivers*

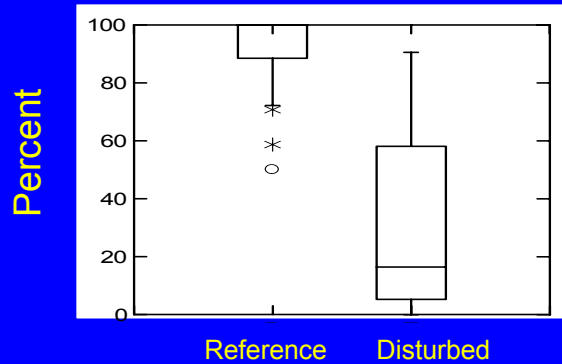


# River IBI development: – compiled data

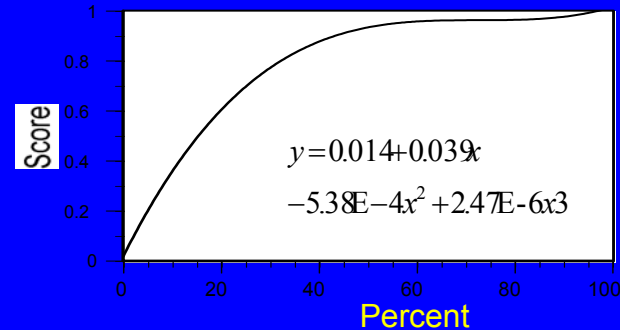
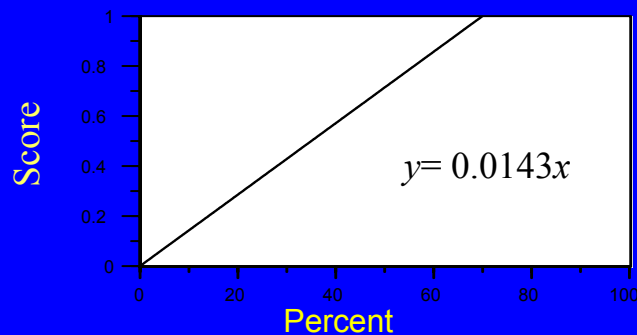
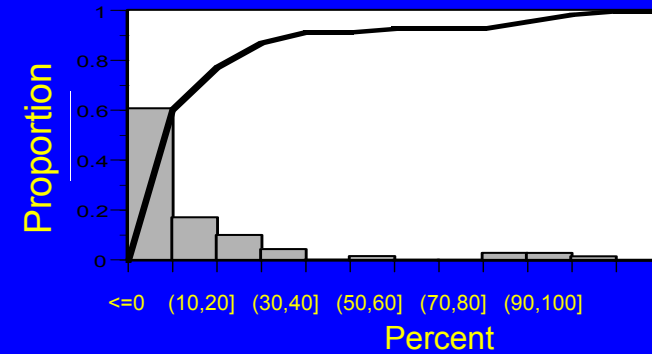
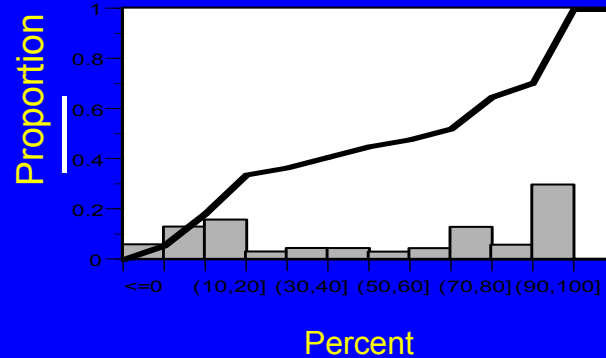
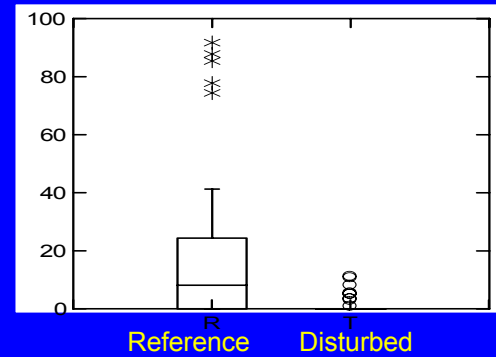


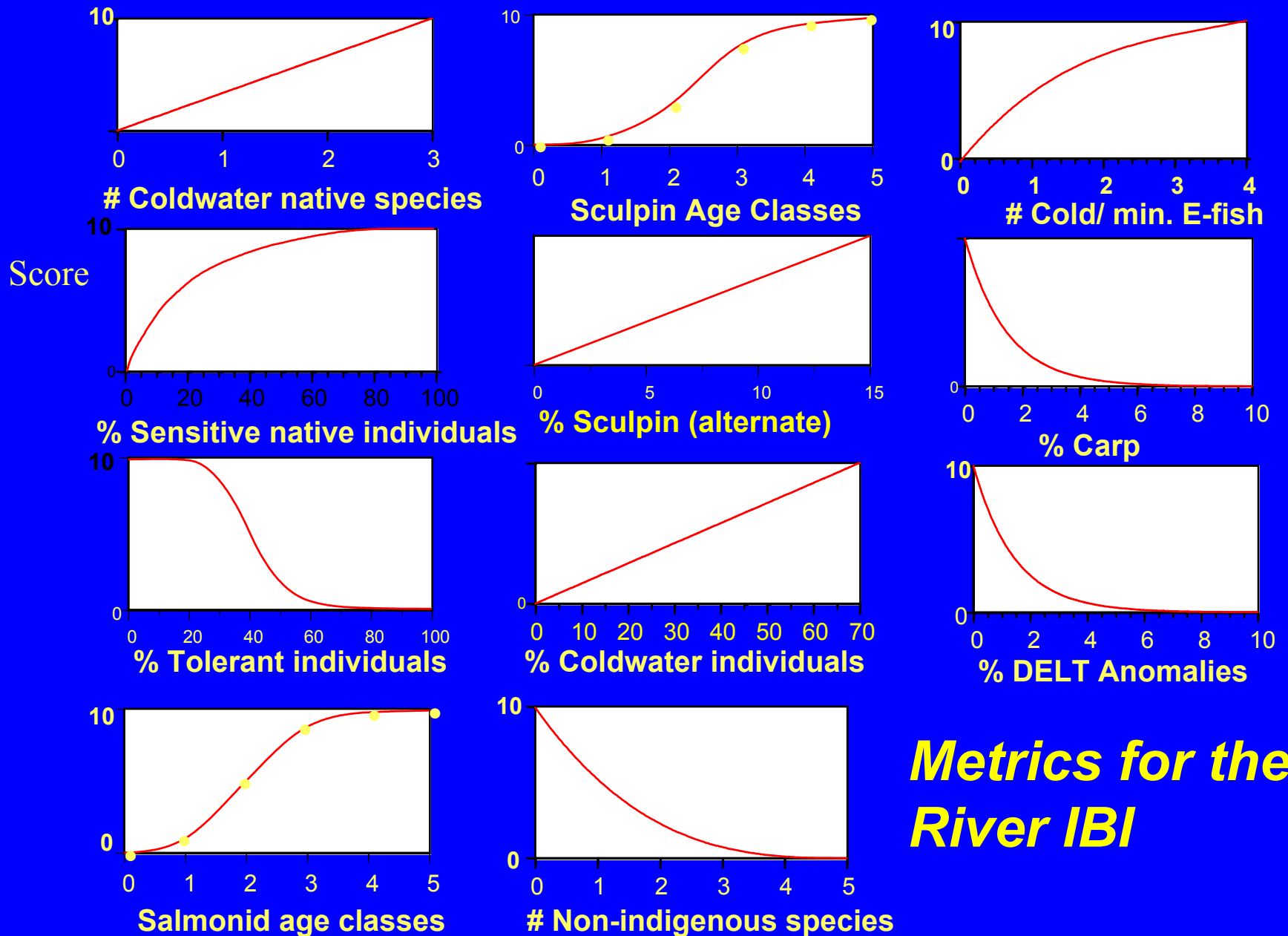
# Tested potential indicators and constructed metrics

Percent coldwater individuals



Percent sensitive native individuals

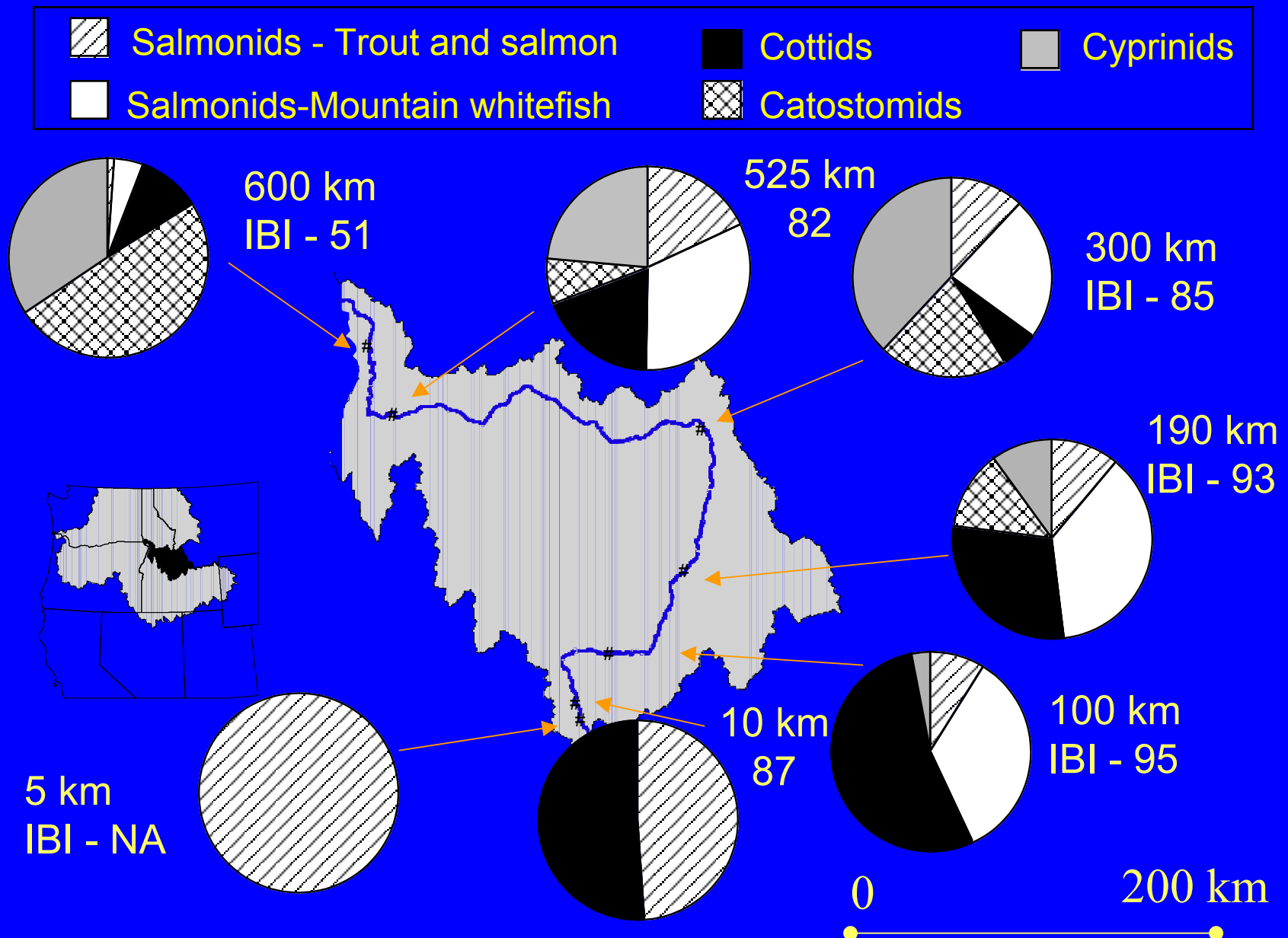




***Metrics for the  
River IBI***



# Longitudinal changes in fish assemblages and IBI scores



# Sampling considerations – what's a representative sample of the assemblage?





# A comparison of EMAP and NAWQA results, Snake River at Nyssa, OR

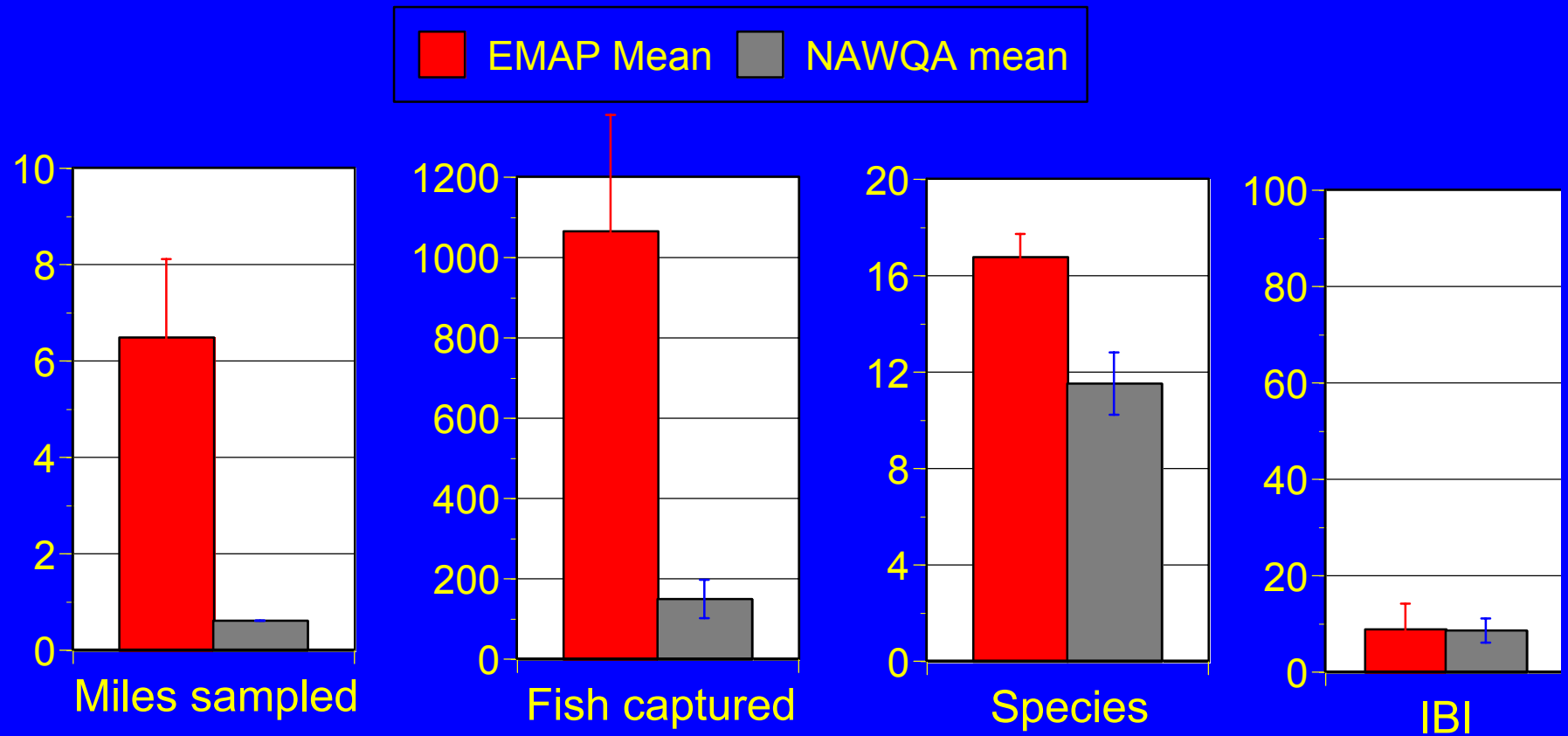


EMAP – E-fishing from paddle raft, target reach length 100X channel width

NAWQA – E-fishing from power boat plus backpack shocking wadable riffles, target reach length 1 km

8 6'97

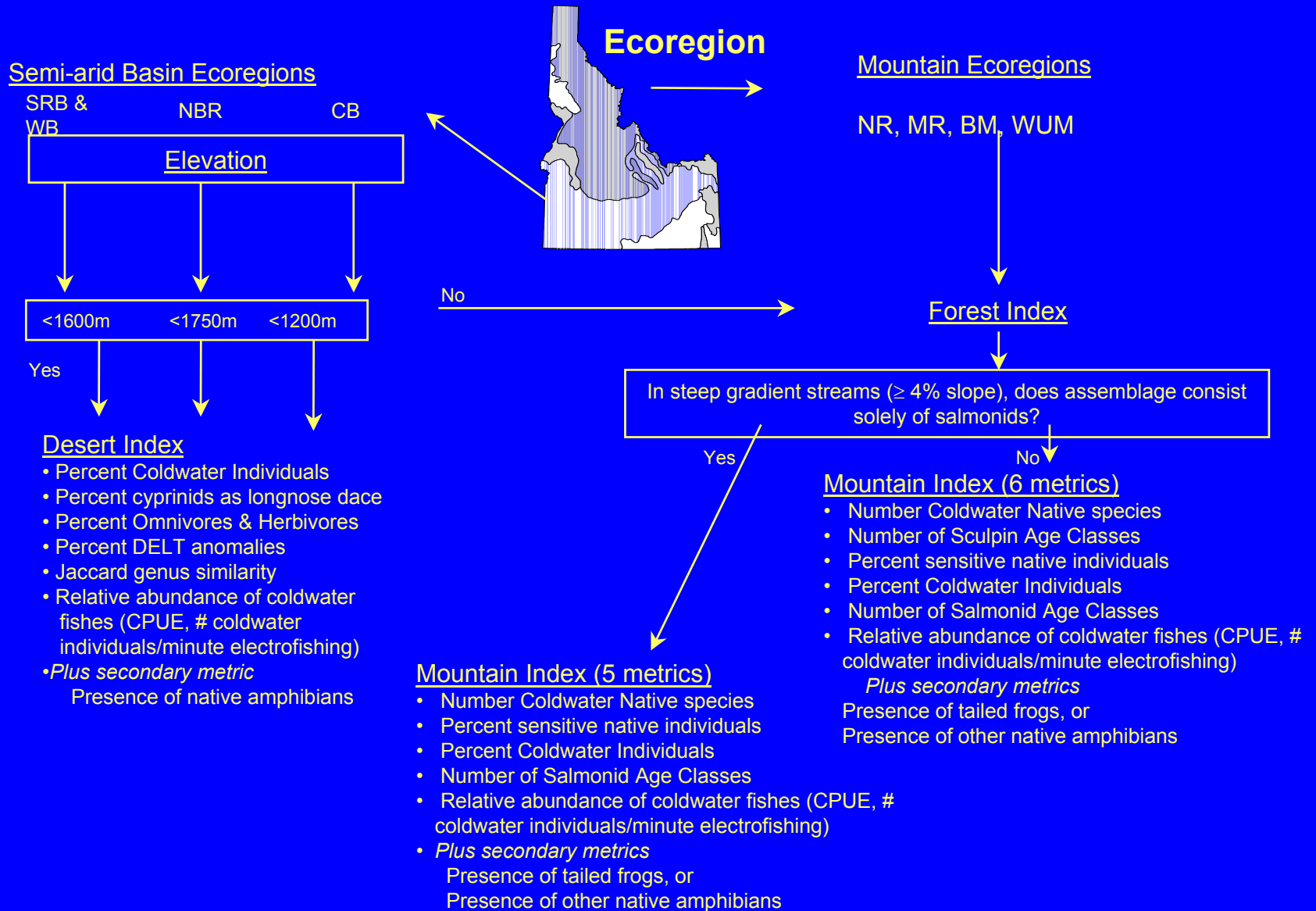
# EMAP and USGS results, Snake River at Nyssa, OR



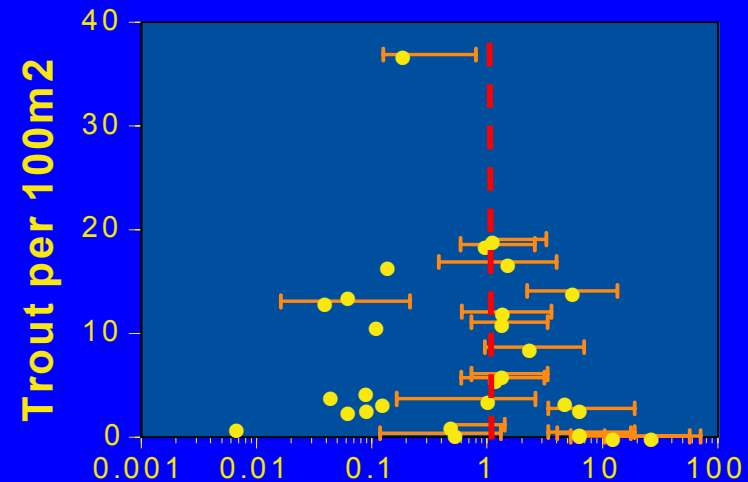
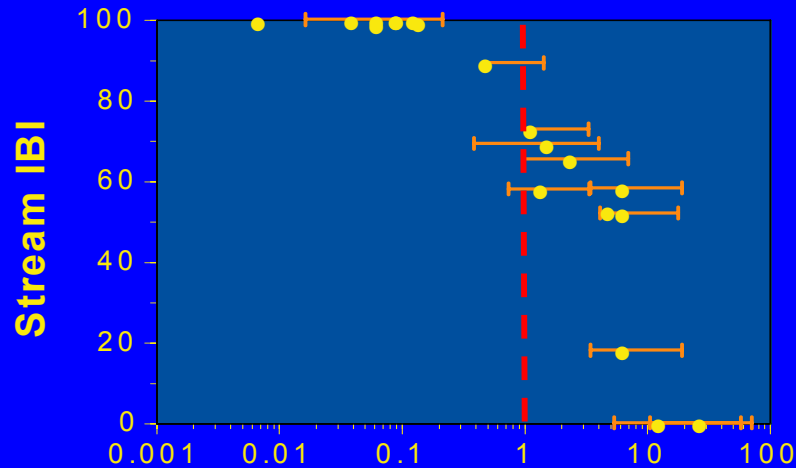
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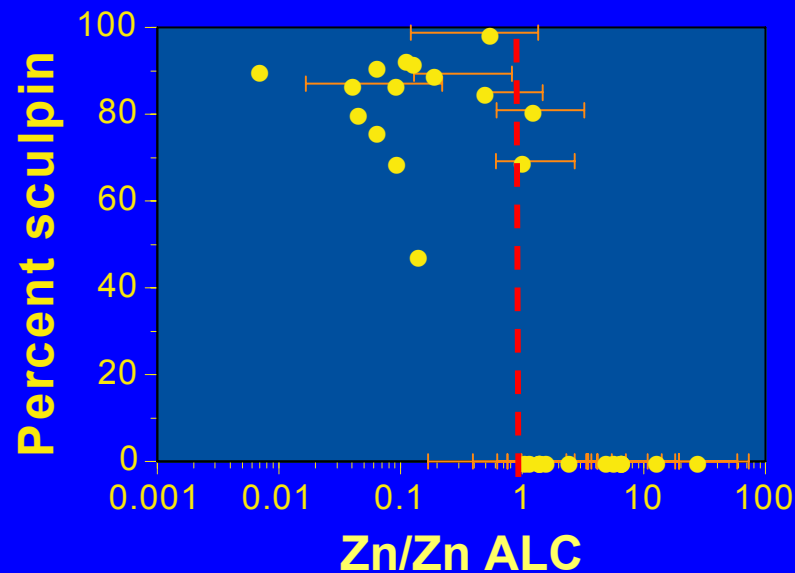
# Stream IBI - Mountain and desert streams



# Stream IBI, trout density, and sculpin presence compared with zinc aquatic life criteria exceedence factors



Zn/Zn ALC



- IBI provided a graded response to criteria exceedences, trout had little response, whereas the sculpin were abruptly extirpated

# Stream IBI - Temporal Variability

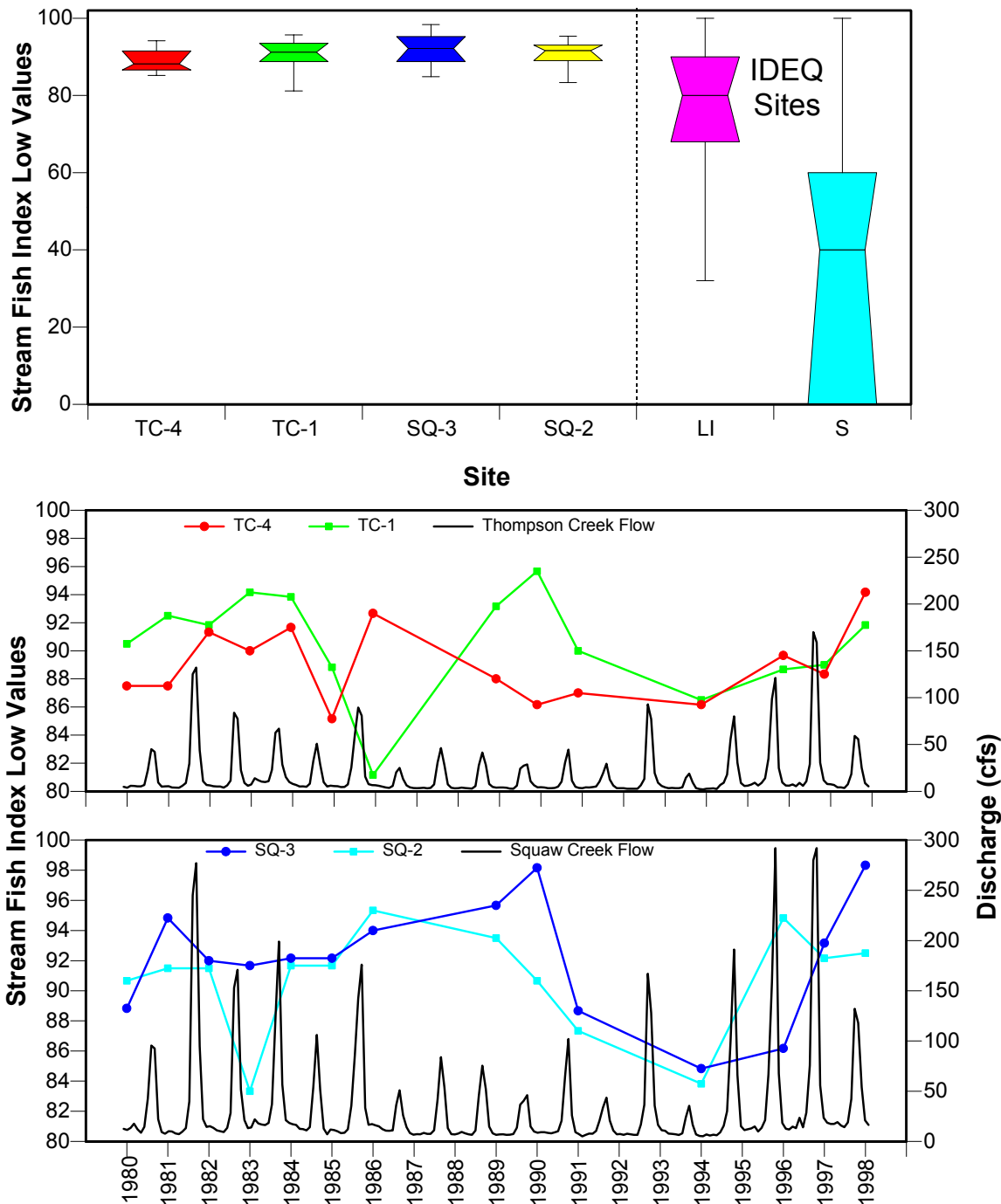


Figure provided courtesy of Steve  
Canton, Chadwick Ecological  
Services, Littleton, CO

# Conclusions

- Fish assemblages can be useful indicators of biological condition in depauperate NW streams and rivers
- IBI approach provides a functional model
- Several apparently confounding problems may be resolved through careful stratification, and metric construction and testing



- The IBI and the mountain-stream IBI appear useful over broad areas.
- Speculate that these or similar indexes could be more broadly applicable than tested so far.
  - Wherever a trout-sculpin-sucker-minnow natural assemblage occurs.

What is the study question? Is it:

- Broadscale indication of how similar or different streams and rivers are from a regional, best attainable, reference condition?  
– *IBIs appropriate*
- Setting measurable biological benchmarks or to evaluate maintenance or restoration of biological integrity? *IBIs appropriate*

- Impact assessment – BACI monitoring for biological effects from waste outfalls, remedial or BMP effectiveness (e.g. monitoring for effects following timber harvest, ecological risk assessment, EIS, NRDA, NPDES monitoring, ...)
  - More specific test questions and measurements endpoints probably needed, but IBIs probably complementary

# Familiarity with study area and data inspection necessary!

- We need to take care in dumbing-down bioassessment (I.e. over-standardizing and over-simplifying).
- Over-reliance on IBI scores could have missed the Mystery of the Missing Sculpin
  - There is a role for judgment

**Ascertain Biological Condition**

**Done**

